

**Michigan Department of Environmental Quality (DEQ) Review Comments on the Tittabawassee River
Segments 6 and 7 (OU1) Response Proposal – Revision 0
Settlement Agreement No. V-W-10-C-942 for the Tittabawassee River/Saginaw River & Bay Site
Dow Submittal Number: 2017.069**

December 22, 2017

The DEQ has conducted a review of the revised Segments 6 and 7 Draft Response Proposal (OU1), which is dated October 20, 2017. Our comments are provided below:

General Comments:

As we have discussed, the MDEQ is supportive of moving forward with agreed upon response activities for the currently identified sediment management areas (SMAs) and Bank Management Areas (BMAs) in a manner similar to those used for other segments as stated in EPA's June 27, 2013 letter to Dow. This letter states in part: *"The Segment 2 Response Proposal was reviewed in accordance with Section X and XI of the 2010 AOC. In accordance with paragraph 37 of the AOC, EPA is approving, with conditions and modifications, the Segment 2 Response Proposal for purposes of making it available for public comment, as required by the National Contingency Plan. The conditions and modifications are attached. Please note that in some cases Dow's responses to the Agencies' comments on the draft document is not considered complete but should not affect response decision making for Segment 2...."*

The DEQ understands that sufficient information is present in the Segments 6 and 7 Response Proposal to move forward with remedial activities on currently identified SMAs and BMAs. However, as previously discussed and noted in the comments referenced and provided on prior RPs, additional Segment 6 and 7 SMAs and/or BMAs that require response activities, beyond those currently identified in the Segment 6 and 7 Response Proposal, may be identified based on further review and discussion.

In addition to the comments provided in the February 2, 2015, review, it was noted that secondary contaminants of interest (SCOIs) such as hexachlorobenzene is present in some bank soils at concentrations that exceed the Part 201 criterion for the protection of the groundwater/surface water pathway. Additional evaluation of these areas needs to be conducted to determine if response activities need to be conducted in these areas.

The Executive Summary needs to be clarified to indicate that the Response Proposal (RP6/7) does not address all of Dow's remedial obligations with respect to the banks and that further work to address other exposure pathways such as human direct contact and terrestrial ecologic risk will be conducted as part of the Floodplain Response Proposal and the Task 10 residual risk assessment(s). As noted later in these comments, the DEQ does not agree that the RAOs currently identified in RP6/7 are adequate. Further, the DEQ does not agree that monitored natural recovery (MNR) will achieve RAOs at Segment 6 and 7 SMAs on a timeframe that is reasonable.

Specific Comments

- 1) Section 1.2. - Comprehensive Site Wide Management Approach. The second to last sentence in this section needs to be clarified as follows (additional language in ***italic boldface***): ...for the purposes of reducing exposure to human and ecological receptors ***to acceptable levels.***

- 2) Section 2.2 – Discussion on Segment 7 should include the presence of residential properties along Riverside Drive as well as public areas such as West Michigan Park, Center Road Boat Launch, trails of Green Point Nature Center, and State of Michigan property that will likely become a public park at the Confluence.
- 3) Section 2.4 - Source Control. This section should be expanded to identify when Dow stopped using the chloralkali process. In addition, Dow should provide a description of other dioxin producing processes and discharges in this section (e.g., 2,4,5-T, pentachlorophenol and other chlorophenolics production).
- 4) Section 2.5 - PCOI Distributions in the River. The duration of the period of direct discharge to the river is not known. It would be more accurate to state (additional/modified language in ***italic boldface***): ***Beginning with the direct discharge period in the early 1900's, the waste anode and cell body particles*** containing the PCOI contaminants mixed(or similar).
- 5) Section 2.6.1 - In Channel Geologic Stratigraphy. This section should be clarified to indicate that glacial till does contain till sand units that can be extensive. These till sands are commonly used for as a potable water source in the study area.
- 6) Section 2.7.2.2 - Reach D Dredging and Capping (2007 – 2009). This section should also include a description of the “natural cap” that is developing outside of the Reach D cofferdam footprint.
- 7) Section 3.2 - Nature and Extent of In-Channel Sediment Contamination
 - a. Additional delineation of sediment contamination is likely to be necessary as part of the design phase of this response. The 10,000 ppt TEQ interim response value is not a final clean up criteria and concentrations well below 10,000 ppt TEQ may need to be addressed as part of the final remediation.
 - b. This section needs to be revised to reflect the approval with modification document provided to Dow from EPA on May 10, 2012, for the initial sediment sampling conducted using this approach. In particular, the May 10, 2012 letter noted:
 - i. It is not clear that a 2 inch sampling depth will be the best way to represent surface conditions and that Dow should not consider the approval with modifications to create a precedent for future sampling.
 - ii. The 2 inch sampling depth should not be considered a statement or conclusion about the depth of the active bed in this part of the river. EPA has noted that additional work will be conducted as part of the SEDA review.
 - iii. The Agencies retained the right to question the appropriateness of the sampling approach and/or the usefulness of the data. The high variability demonstrated by the replicate analyses may limit the use of this type of data for establishing baseline conditions and/or conducting trend monitoring.

- iv. Additional technical comments and concerns were provided to Dow in the May 10, 2012 letter that should be addressed prior to the acceptance of this approach for characterization and/or monitoring.

As we have discussed in the technical meetings, the DEQ is open to working with Dow and U.S. EPA to refine this methodology to improve its potential usefulness. Further, the DEQ understands that Dow primarily used a 6-inch sampling interval for evaluations, and calculations associated with sediment core data for segments 6 and 7, and the derived surface weighted average concentration (SWAC) still does not necessarily represent river-wide sediment conditions from an exposure standpoint.

8) Section 3.2.1 - In-Channel Sediment Primary Constituents of Interest (PCOIs)

- a. Figures need to be revised or supplemented to show TEQ concentrations less than or equal to 100 parts per trillion (ppt) TEQ and greater than 100 ppt TEQ but less than or equal to 500 ppt. This is necessary to assist in the evaluation of Dow's proposed sediment management areas. Areas of sediment contamination that are present below 500 ppt TEQ may be significant in terms of remedial needs.
- b. This section should be augmented with a description of the uncertainty associated with the SWAC presented for Segments 6 and 7 (352 ppt TEQ).

9) Section 3.2.2 - In-Channel Sediment Secondary Constituents of Interest (SCOIs). The agencies have previously commented on the SCOI screening process that Dow has used for Segments 2 and 3 and these concerns remain for Segments 4 - 7 (i.e., see Condition/Modification 4 of EPA's June 27, 2013, Approval Conditions/Modifications for the Tittabawassee River Segment 2 Response Proposal). The DEQ remains concerned that additional work may need to be done to address SCOIs after response activities have been completed on PCOIs. It is understood that Dow has provided the screening for Segment 6 and 7 in the Sediment and Bank Soil SCOI Screening for Segments 4 through 7 of Operable Unit 1 for the Tittabawassee River/Saginaw River and Bay Site (submitted December 15, 2015).

- a. How are SCOI bioaccumulative chemicals of concern (BCCs) such as hexachlorobenzene being evaluated (e.g., the potential for low exposure/risk level (PLER) for chlorobenzenes does not address bioaccumulation)?
- b. Does there need to be a way to evaluate other areas that did not have SCOI samples, but may have similar depositional characteristics as those where SCOIs were detected above benchmarks?

10) Section 3.3.2.1 – PCOI Results from 2007 – 2014 Bank Soil Coring

- a. Figures need to be revised to show TEQ concentrations less than or equal to 250 ppt TEQ and greater than 250 ppt TEQ but less than or equal to 2000 ppt TEQ, consistent with the clean-up criteria identified in the Floodplain Response Proposal. The RP6/7 diagrams only show data above 500 ppt TEQ. Areas of bank contamination that are present below 500 ppt TEQ may be significant in terms of remedial and long-term monitoring needs and using the Floodplain Response Proposal clean-up criteria will assist in the overall site-wide management of bank soils.

11) Section 3.3.2.3 - Comparison of Bank LWA and (Bank Face Composite) BFC PCOI Results.

- a. The BFC TEQ results are important in that they show the actual exposed concentration of bank soils that is eroding into the river. As noted in previous comments on this issue, the surface concentrations of TEQ in bank soils needs to be recognized as an important factor in determining what banks are prioritized for stabilization and what type of stabilization is proposed (i.e., for banks with high TEQ currently exposed at the surface, stabilization technologies that include a barrier component may be more appropriate). In addition, this type of sampling could be used to evaluate high TEQ banks that are currently identified as “high” or “moderate” stability for prioritized monitoring or enhanced monitoring for possible future identification as BMAs. If the bank face concentration is high (i.e., the high concentrations are not buried) then they have a greater potential for actively providing TEQ to the river at more significant rates.

12) Section 3.3.3 Bank Soil SCOIs

- a. There is no discussion of the levels of recently deposited soils on floodplain property. This is a primary exposure pathway that is dynamic after each high water event. While it is important to understand the TEQ distribution in bank soils at depth and lateral extent, the surficial concentrations of recent deposits needs adequate assessment.

13) Section 3.3.3 and 3.3.3.1 - Bank Soil SCOIs and Evaluation of Bank Soil SCOIs

- a. The agencies have previously commented on the SCOI screening process that Dow has used for Segments 2 and 3 and these concerns remain for Segments 4 - 7 (i.e., see Condition/Modification 4 of EPA’s June 27, 2013, Approval Conditions/Modifications for the Tittabawassee River Segment 2 Response Proposal). The DEQ remains concerned that additional work may need to be done to address SCOIs after response activities have been completed on PCOIs.

14) Section 3.4.1 – Differential Bathymetry Analysis

- a. Three surveys conducted in the Spring of 2008, 2009, and 2016 do not give an indication of sediment stability for the river system.

15) Section 3.4.2 - Bed Pin Analysis

- a. The presented bed in-channel cross sections demonstrate an active bed depth of greater than 2 feet in a number of locations in Segments 6 and 7.

16) Section 3.5 - Biological Conditions

- a. The DEQ requests that EPA incorporate the Natural Resource Damage Assessment Trustee Comments on this Section into this review.

17) Section 3.6.3 – Identification of Historic or Culturally Significant Resources. The DEQ requests that EPA specifically incorporate the Natural Resource Damage Assessment Trustee Comments on this Section into this review.

18) Section - 3.7.2 Direct Contact Ecological Receptors

- a. The SCOI data set may be adequate to identify necessary responses. Additional data collection may be necessary for design purposes.
- b. Please see earlier comments on SCOI screening process. Additional work is necessary with respect to this issue.

19) Section 3.7.3 - Bioaccumulation and Potential Food Web Exposures

- a. Bioaccumulation and potential food web exposures in the floodplain remain to be addressed.

20) Section 3.8.1 - Identification of SMA Locations in Segments 6 and 7

- a. Dow needs to provide additional information on the multiple lines of evidence cited for the identification of a SMA. What criteria were used to identify a “contiguous deposit of elevated concentration of TEQ.”
 - i. What concentration is considered elevated?
 - ii. What constitutes a contiguous deposit?
- b. Dow needs to provide an evaluation of all elevated TEQ areas to show why they do not need to be SMAs. The DEQ agrees that the four SMAs currently identified are SMAs.

21) Section 3.8.2 – Delineation of SMAs

- a. Reach YY SMA accumulated 1.5 feet of material, and the TEQ deposit is from 0.5 to 4.5 ft. The bathymetric survey and bed pin conclusions on sediment stability are in question, as they fail to consider the possibility that most of the top 0-5 ft of sediments in these SMAs are actually fresh deposits for that year and that any data older than a year was simply a point in time concentration.

22) Section 3.8.2.5 Other Areas of Interest in Segments 6 and 7.

- a. An area in middle Reach QQ contained two contiguous cores where one sample within the core contained TEQ levels greater than 10,000 ppt. These elevated TEQ levels occurred at depths of 0–0.5 ft (core RQQ-1023+50-IC43) and 0.5–1 ft (core RQQ-1023+00-IC44), as shown in Figures 3-15 A and B. The multiple bathymetric surveys indicate that these surface sediment samples are part of the active bedload, not part of a deeper contiguous deposit. As a result, middle Reach QQ is not carried forward as an SMA. This location would be a candidate for evaluation of a potential sediment trap.
- b. An area in lower Reach UU was also considered an area of interest. In this area, one core (RUU-1141+50-IC317) contained a single sample with a TEQ level greater than 10,000 ppt, at a depth of 0–0.5 ft, as shown in Figures 3-16 A and B. In addition, an adjacent core (RUU-

1142+00-IC311) contained a TEQ level of 2,200 ppt at a depth of 0–0.5 ft. The bathymetric surveys demonstrate these elevated TEQ samples are part of the active bedload, not part of a deposit. As a result, the area of interest in Reach UU is not carried forward as an SMA. The DEQ recommends monitoring at this location for the potential installation of a sediment trap to manage TEQ in the active bedload.

23) Section 3.9 – Bank Management Areas. General.

- a. The DEQ does not object to the concept of prioritizing banks for action; however, it is not yet known if the current approach will be adequate for remediation purposes.
- a. The following lines of evidence need to be incorporated into the lines of evidence used to evaluate current bank stability in the Segments 6 and 7 response proposal:
 - i. Historic Air Photo Evaluation. It is recognized that there is some uncertainty in the evaluation of historic air photos; however, this level of uncertainty is certainly no greater than the uncertainty in predicted rates of bank erosion.
 - ii. Evidence of Mass Wasting (e.g., at risk or drunken trees, slump blocks, fresh scarp faces, etc.). The presence of large scale erosion features is a clear indication of bank instability and needs to be included as a line of evidence in the stability evaluation.

24) Section 3.9.3 - Bank Stability Evaluation.

- a. The Agencies need to retain the ability to objectively overrule determinations of bank stability when those determinations do not appear to reflect reality in the field.

25) Section 3.9.3.2 – Evidence of Undercutting.

- a. Dow should provide representative LiDAR bank profiles for each bank section in Segments 6 and 7.

26) Section 3.9.3.6 – Model Predicted Bank Erosion Rate.

- a. The calculated rate appears to reflect an average rate over the entire bank full bank face within a 300 foot grid cell. Therefore, the model predictions need to be evaluated cautiously as the averaging process may mask local areas of erosion that may be significant.
- b. The rationale for selecting a 2.5 inch per year erosion rate as the threshold between high/moderate stability and low stability is not clear. Over two feet of erosion in ten years does not seem to be “stable” – especially with respect to contamination that is near or at the bank face.
- c. While the modeled magnitude of the erosion rate is useful for prioritizing the banks for action, Michigan is not “approving” a modeled loss to the river of contaminated bank soil at less than 2.5 inches per year as being acceptable.

27) Section 4 Remedial Action Objectives for Segments 6 and 7

- a. Other pathways of concern such as human direct contact and terrestrial ecological risk are being addressed in the Floodplain Response Proposal and/or the Task 10 Residual Risk Assessment,” or similar.

28) Section 4.1 - Segments 6 and 7 Conceptual Site Model and Basis for Action.

- a. The section does not address the pathway of floodplain soils eroding back into in-channel sediments. The magnitude and significance of this pathway is not currently known.

29) Section 4.2- Remedial Action Objectives

- a. As currently written, the RAO 1 General Response Objective in the RP is “Reduce potential transport of TEQ-impacted media that may contribute to increased surface-sediment TEQ levels in/or downstream of Segments 6 and 7.” The associated performance objectives are to “Reduce TEQ contributions from potentially significantly eroding bank deposits/in-channel deposits to the to the sediment surface. “

These are not specific enough and needs to be expanded and clarified to be consistent with Paragraph 8.3.1 of the AOC Statement of Work (SOW)) which indicates that the “objectives shall focus on reducing exposures to and transport of contaminated media for purposes of achieving acceptable levels of human health and ecological risks.” The reductions need to be tied to achieving acceptable risk levels. As currently written, it could be argued that *any* reduction would meet the RAO over any timeframe.

- b. As currently written, the RAO 2 General Response Objective in the RP is “Reduce Segments 6 and 7 contributions to TEQ levels in OU1 fish tissue.” The associated performance objective is to “Conduct and/or maintain response actions that contribute to reduced fish exposures to surface sediment TEQ.”

Again, these do not appear to be specific enough and need to be tied to achieving acceptable risk levels over a reasonable time frame.

- c. The RP needs to include discussion of how the other General Response Objectives that are identified in Paragraph 8.3.1 of the SOW will be addressed – either under this response proposal or under the Floodplain Response Proposal.

These other SOW General Response Objectives (that are not specifically identified in the RP) include but are not limited to reducing current or potential unacceptable human health risks associated with direct and indirect exposures to contaminated sediments, banks and floodplain soils; and consumption of contaminated wild game. For ecological risk the general response objectives include reducing current or potential future unacceptable risk to ecological receptors associated with contaminated media or food chain exposures.

30) Section 4.3 - Applicable or Relevant and Appropriate Requirements.

- a. General comment. With respect to chemical specific ARARs, it is important to note that the DEQ has determined that in order for Dow to meet their corrective action obligations under

Michigan law and their Hazardous Management Facility Waste Operating License (License), Dow will need to meet the performance based risk standards identified in Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). Michigan's risk range is narrower (maybe more stringent) than EPA's and specifies a ceiling cancer risk level of 1 in 100,000 and/or a Hazard Index of 1 (MCL 324.20120a (4)) for individual properties/exposure units along the Tittabawassee River. Therefore, the DEQ is retaining Part 201 as a chemical-specific ARAR that is potentially applicable. This ARAR is potentially applicable to chemical monitoring conducted as part of the measureable metrics, setting the performance standard for the Task 10 risk assessment, soil relocation, and meeting Dow's corrective action obligations under their Part 111 License.

- b. Footnote 10 should be amended to note that Michigan Part 201 Criteria (both generic and site-specific) were identified as chemical specific ARARs.

31) Section 4.3.2.7 – Michigan Natural Resources and Environmental Protection Act

- c. Hazardous Waste Management – Part 111; The second sentence should be changed to note 'hazardous waste'.

32) Section 5.1.1 – Monitored Natural Attenuation (MNR)

- a. As noted in previous comments provided by the DEQ, the TEQ transport model and predictions made from this model are suspect and should not be relied upon.

33) Section 6.1.1 – Effectiveness

- a. General. There should be some discussion in this section on how effectiveness criteria will be met (overall protection of human health and the environment) by addressing other potentially significant exposure pathways for bank contamination as part of the Floodplain Response Proposal (e.g., direct human contact, ecological risk, etc.).
- b. Overall Protection of Human Health and the Environment. As noted previously, the RAOs cited in this section need to be revised to be more consistent with the requirements of the SOW.
- c. Effectiveness Evaluation. As noted in earlier comments, the referenced RAOs need to be strengthened to be consistent with the requirements of the SOW by adding a temporal and spatial component and specifying that acceptable levels of risk will be met.

34) Section 6.3 – SMA Alternatives Evaluation

- a. Section 6.3.1.1 – Overall Protection of Human Health and the Environment.
 - i. As noted in earlier comments, the information provided in the RP6/7 do not support the statement "...buried SMA TEQ deposits have a relatively low likelihood of being eroded and transported downstream..."

- ii. Alternative 1 (MNR). Review of the sediment cores and the bed pin data shows that the contaminated materials are present at or within the active bed depths of the currently identified SMAs.

- b) Section 6.3.1.2 – Compliance with ARARs. Alternative 2 (In Situ Containment) and Alternative 4 identifies a 0.1 foot limit mandated by the Michigan Floodplain Act. This has been reviewed by DEQ Water Resources Division staff and determined to be incorrect. No increase is allowed under the Act.

35) Section 6.3.1.5 – Long-term Effectiveness and Permanence.

- a. MNR has not been demonstrated to be effective on an acceptable timescale in the absence of additional secondary source controls, even decades after primary source controls have been implemented at the Dow Plant site. Other items that are not discussed include:
 - a. Changes in river morphology that could alter the course of the main channel and erode SMA deposits.
 - b. Risk of deposit loss.
- c) Section 6.4.1.2 – Compliance with ARARs. As noted in earlier comments, the 0.1 foot limit with respect to flood elevation increases is not accurate.

36) Section 7 Response Proposal

- a. Please see previous comments regarding the inadequacy of the RAOs.